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ABSTRACT

This report briefly reviews the rationale for and history of a cooperative effort of the National Association for Research in Science Teaching and the National Science Teachers Association to increase the influence of classroom science teachers on science education research and to improve teachers' perception of the relevance of science education research. Processes, initial results, and planned future activities and procedures are reported that relate to obtaining input from teachers to identify relevant research questions related to classroom practice. An analysis of data collected from questionnaires submitted to science teacher personnel (N=45) is presented that summarizes research needs of secondary and of elementary science teaching personnel. (CS)

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A Study of the Research Priorities as Perceived by Elementary and Secondary School Science Personnel

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NATIONAL INSTITUTE OF EDUCATION

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School Science Personnel

Introduction

The influence of science education research on classroom teaching practice is not as great as many would like it to be. This lack of influence may be due to a number of reasons.

Three major factors can be identified which have a bearing on this problem.

1. Perceived lack of relevance of research results for teachers as they look for guidance to deal with daily concerns and decisions faced in the classroom.
2. Inappropriate style of communicating implications of research to classroom teachers.
3. The methods of dissemination of research results and the implications for science teaching.

In many instances the communication between researchers and teachers has been a one way communication. To often the teachers feel that the researchers are making recommendations which are irrelevant to the needs in the classroom or which are not feasible. The perceptions which teachers have relative to needs in science teaching must be obtained and incorporated into research in science education if the results are to have practical influence on practice.

The communication concerning implications of research to classroom practice has not been as effective as it might. Often findings are presented in a style and language foreign to the teachers. Columns for what research says to the classroom teacher are included in Science and

Children, The Science Teacher and Journal of College Science Teaching. The NSTA publications staff reports considerable difficulty in obtaining articles which are suitable for these columns. If more public school science teachers were actively involved with the science education researchers in the identification, planning and conducting of research activities they could help communicate the results and implications to teachers in a style and with a language which would be more acceptable.

NSTA has been involved in a project which includes action related to this mechanism. The monograph series What Research Says To The Science Teacher (1978, Rowe) was generated and published under a grant from the National Institute of Education. A series of seminars were conducted during 1978 and 1979 in which the authors of the articles in the monograph discussed and interpreted the research findings with secondary school staff at five locations across the country. Dissemination efforts such as these seminars along with workshops and presentations at local, regional, area and national meetings need to be encouraged as cooperative efforts between researchers and public school science educators.

Recently the National Association for Research in Science Teaching (NARST) and the National Science Teachers Association (NSTA) supported a cooperative effort designed to increase the influence of classroom science teachers on science education research and to improve teachers perception of the relevancy of science education research. This should serve to establish better credibility of researchers with teachers and of teachers with researchers thus making the impact of research on classroom practice more likely. A major objective of this effort was stated as follows:

> To obtain input from teachers to identify relevant research questions related to classroom practice.

This report includes the processes, initial results, and planned future activities and procedures related to the above objective. It is organized

in two parts with the procedures and results of the secondary science teaching research needs first followed by that of the elementary science teaching research needs.

Secondary

Procedures

A question to solicit secondary school science teachers' suggestions for needed research related to classroom practice was drafted by the Research in Science Teaching Committee (NSTA) and included in a questionnaire sent to participants in the monograph-seminar series sponsored by NSTA.

The following question was responded to by 145 science teaching personnel:

> "Based on your teaching experiences, what kinds of research related to classroom teaching practices would you like to see done?"

Data were also collected from each participant in the seminar series concerning their job position, content area taught, teaching experience and community type served by their school. One-hundred and thirty-seven usable sets of data were returned to the NSTA headquarters. The responses to the research question were examined by a panel of four science educators who classified them into logical groupings based on the majority opinion of the panel. Twelve groupings or categories of research needs resulted from this process.

Results

Results from data analysis on the demographic characteristics of the respondents are given in Table 1. As can be noted, the majority (62%) were males; fifty percent held teaching positions; while, forty-eight percent had department head duties. About half taught biology (45%) and/or chemistry (46%); twenty-two percent taught physical science. Most of the participants (94%) had more than five years experience; while, fifty-two

percent had more than fifteen years experience. Large and small cities were represented by most of the participants (42% and 28% respectively).

The twelve categories of research areas identified from the participants of the seminar series are presented in table 2.

Table 1

Background Information on Participants in the NSTA Research Seminar who Responded to the Inquiry on Science Education Research Needs

VARIABLE		f	%
SEX	Males	85	62
	Females	52	38
POSITION	Teacher	68	50
	Department Chairman	66	48
	Science Coordinator	21	15
	Administrator	3	2
	Other	3	2
CONTENT AREA	Biology	62	45
	Chemistry	63	46
	Earth Science	17	12
	General Science	21	15
	Physical Science	30	22
	Physics	35	26
EXPERIENCE	1 - 5 years	8	6
	5 - 10 years	25	18
	10 - 15 years	33	24
	> 15 years	71	52
COMMUNITY TYPE	Small Town	23	17
	Rural	5	4
	Small City	38	28
	Large City	57	42
	County	3	2
	Other	1	<1

Table 2

Research Concerns of Secondary Science Teaching Personnel as Classified by a Panel of Science Educators

RESPONSE CATEGORIES	f	%
1. Research on the influence of science classroom experiences on cognitive achievement. *Examples:** How teaching strategies affect student achievement Which teaching methods work best for certain basic concepts? Lecture, lab, inquiry, rote, LAPS, etc. Research related to productivity of various patterns of interaction between teachers and students	20	22
2. Research on the effects of teaching science in the interdisciplinary dimension as it relates to areas such as mathematics, social studies, and reading. *Examples:* The relationship between using calculators in science class and an improvement in mathematical ability Relationship between math skills and science achievement Improving reading and language skills while teaching science The most effective methods to approach social issues in science	13	15
3. Research on motivational techniques that relate to learning and continue involvement in science. *Examples:* Research related to promising practices in teaching science to reluctant learners Techniques which generate enthusiasm in all students Ways of encouraging more students to take upper level courses	12	13
4. Research on the effectiveness of laboratory experiences in the science classroom. *Examples:* The effect of traditional lab experiences versus those involving inquiry Detailed look at benefits of laboratory science Use of safe practices in a laboratory experience	11	12
5. Research on the influences of science classroom experiences on pupil attitudes. *Examples:* Evaluation of importance of supplementary science experiences and their effect on attitude development Relationship of classroom management techniques to student feelings about science A correlation between "hand-on" or cognitive experiences and attitudes toward science in general	11	12

*Examples of the teacher statements are included for clarification.

Table 2 (continued)

RESPONSE CATEGORIES	f	%
6. Research on the selection and sequencing of science content in the curriculum. *Examples:* Knowledge versus process: finding a balance in science instruction Effectiveness of sequencing of science courses (e.g., biology, chemistry, physics) Effectiveness of various science programs such as unified science	10	11
7. Research on the relationship of student cognitive development and learning styles to science curriculum development and teaching. *Examples:* Matching students' cognitive development to the teaching methods Learning styles of students and related effective teaching strategies Ways to identify the learning needs of students	9	10
8. Research on the effectiveness of supplementary science experiences (e.g., projects, clubs). *Examples:* Effects of student science projects on learning scientific principles and application of scientific methods to everyday situations Effectiveness of clubs and science fairs in teaching science Assisting students with the methods and procedures of project work	7	8
9. Research on and development of valid and reliable science testing and grading procedures. *Examples:* Pass - fail versus A - F grades Development of reliable evaluative instruments to measure effectiveness of science instruction (content and process) Effects of evaluation (grading) on student learning	6	7
10. Research on the influence of public school science experiences on success in college science courses. *Examples:* The retention of scientific facts from high school to college Various learning systems versus student success in college science courses Research which analyzes the forms of science education and correlates them to the success of the students in college	6	7

Table 2 (continued)

RESPONSE CATEGORIES	f	%
11. Research on effectiveness of individualized learning activities in science classes.	4	4
Examples:		
Effects of individualized learning versus group pacing		
Effects of total contract courses versus lecture and exams		
How to manage idividualized laboratory programs		
12. Research on the influence of teacher characteristics on pupil learning and attitudes.	3	3
Examples:		
How the teacher's personality affects classroom learning		
Correlation between teachers' attitudes toward science and students' attitudes		

As can be noted, the category represented by the most responses (22%) relates to the influences of science classroom experiences on cognitive achievement. The other response categories, their frequency of representing statements, and percent of total can be examined in Table 2.

No priorities can be assigned to the research statements because the individuals submitted their own concern but did not examine them in light of the full set of concerns. An instrument has been prepared to collect information from a broad sample of secondary school teachers concerning their perception of the relative importance of these twelve categories of research on secondary school teaching. The instrument is Appendix A of this report.

Elementary

Procedures

Members of the research committees for NSTA and NARST distributed questionnaires to elementary school teaching personnel in their areas. The questionnaires were designed to collect background data on the respondents and to collect teachers' perceptions of the kinds of research related to classroom teaching practices that should be done. One-hundred thirty three persons responded. Of those respondents 108 or 81.2% made suggestions concerning needed research. These suggestions were categorized and summarized by a panel of three science educators. Seventeen categories of research needs resulted from this process.

Results

Results from data analysis on the background characteristics of the respondents are given in Table 3.

Table 3

Background Information on Elementary School Personnel Who Responded to the Inquiry on Science Education Research Needs

VARIABLE		f	%
LOCATION	Florida	14	10.5
	Georgia	10	7.5
	Iowa	36	27.1
	Kansas	26	19.5
	Ohio	9	6.8
	Pennsylvania	16	12.0
	Michigan	22	16.5
SEX	Males	30	22.6
	Females	103	77.4
POSITION	Teacher	115	86.5
	Department Head	4	3.0
	Science Coordinator or Supervisor	7	5.3
	Administrator	3	2.3
	Other (mostly preservice teachers)	16	12.0
GRADE LEVEL	K	15	11.3
	1st	8	6.0
Mean = 3.87	2nd	10	7.5
Sx = 2.30	3rd	27	20.3
	4th	18	13.5
	5th	22	16.5
	6th	20	15.0
	7th	5	3.8
	8th	3	2.3
	9-12	5	3.8

Table 3 (continued)

VARIABLE		f	%
EXPERIENCE	none (pre-service teachers	11	8.3
Mean = 2.09 years	1-5 years	36	27.1
Sx = 1.22	6-10 years	39	29.3
	11-15 years	24	18.0
	16 & more	23	17.3
COMMUNITY TYPE	small town	34	25.6
	rural	22	16.5
	small city	59	44.4
	large city	13	9.8
	county	2	1.5
	other	6	4.5

As can be noted the respondents were from seven different locations. The majority (77.4%) were female; over eighty-six percent held teaching positions; and about sixty-five percent taught at the upper primary or intermediate grade levels (3-6). About eight percent of the respondents were preservice teachers; half of the respondents had from 1-10 years of teaching experience. The majority of the respondents represented small town, rural and small cities. The sample included less than 10% from large cities.

The seventeen categories of research areas identified from the respondents to this survey are presented in table 4.

Table 4

Research Concerns of Elementary School Science Teaching Personnel as Classified by a Panel of Science Educators

Response Categories	f	%
1. Research on the influence of pre and inservice teacher education programs on the science teaching behaviors and effectiveness of elementary teachers. Examples: A. How effective are inservice programs developed to help implement a particular science program? B. What is the relationship between a teacher's training and the performance of the pupils? C. What topics and format are appropriate for inservice workshops in elementary school science?	15	13.9
2. Research on development of effective curriculum for teaching contemporary topics such as energy, environment, and the human life cycle. Examples: A. How much can a primary child learn about energy and conservation? B. Can effective materials be developed on the human life cycle? C. How can we teach environmental science in grades 1-6?	15	13.9
3. Research on the relationship of teaching strategies on learning in science. Examples: A. What activities are best suited for each process skill at various grade levels? B. What methods of teaching are most effective for learning science concepts at various grade levels? C. How does television instruction influence science learning?	14	13.0

Table 4 (continued)

Response Categories	f	%
4. Research on the effectiveness of "hands-on" experiences in elementary school science. Examples: A. Is the hands-on approach better than a textbook approach? B. How do students with hands-on elementary science background perform in high school science? C. Does the hands-on science approach teach the necessary basics of science?	11	10.2
5. Research on the effects of teaching science in the interdisciplinary dimension as it relates to areas such as mathematics and language arts. Examples: A. Relationship between math skills and science achievement B. Improving reading and language skills while teaching science C. The incorporation of science into daily curriculum	9	8.3
6. Research on the sequencing of science content in the elementary curriculum. Examples: A. Can we develop continuity of concept formation from one grade level to another? B. Do certain concepts need to be taught before others? C. How effective is a spirally organized science curriculum?	8	7.8
7. Research on the selection of science content in the curriculum. Examples: A. What scientific information should be considered basic to elementary school science? B. Do students need to know all the content in todays elementary science curriculum? C. Should we teach more practical science information such as knowledge of drugs, the body, and weather?	8	7.8

Table 4 (continued)

Response Categories	f	%
8. Research and development of more effective printed materials for teaching elementary school science. Examples: A. Can elementary science be taught in shorter units? B. How can readability of science materials be modified? C. How does the content of science texts compare to the content of standardized tests?	7	6.5
9. Research on the effectiveness of the federally funded elementary science curriculum projects. Examples: A. Are the ESS, S-APA, and SCIS programs effective? B. Are students who use the ESS, S-APA or SCIS programs getting a good content background in science?	6	5.6
10. Research on the influence of science classroom experiences on pupil attitudes. Examples: A. Why has there been a decreased interest in science? B. What is the relationship between affective and cognitive outcomes? C. Do science oriented lessons promote positive group interactions?	5	4.6
11. Research to determine the appropriate and most effective balance of process skill and concept learning in elementary school science. Examples: A. How do the outcomes of a process centered approach and a content centered approach differ? B. Is there a need to learn more facts along with the investigative techniques? C. What are the effects of programs which combine process and content?	5	4.6

Table 4 (continued)

Response Categories	f	%
12. Research on the learning outcomes of teacher determined versus student determined activities in elementary school science. Examples: A. How much direction for students is best in science teaching? B. How valuable are teacher demonstrations when compared to experiments done by children? C. Which is more beneficial, teacher directed science lessons or informal experiences that are part of play experiences?	5	4.6
13. Research on the effectiveness of science learning centers in elementary school science. Examples: A. What is the value of science oriented discovery centers? B. Can learning centers be effective for large groups?	4	3.7
14. Research on the effects of specialized science teachers and facilities on teaching and learning of elementary school science. Examples: A. How do student gains of specialized and self-contained classroom teachers differ? B. Is science teaching in a special science room more effective than in a regular room?	4	3.7
15. Research on the relationship of student cognitive development and learning styles to science curriculum development and teaching. Examples: A. Matching students' cognitive development to the learning materials and activities B. Learning styles of students & related effective teaching strategies	3	2.8

Table 4 (continued)

Response Categories	f	%
16. Research and development of techniques and materials to assist disadvantaged elementary science students. Examples: A. How can visually or physically handicapped students participate in all areas of science? B. What science topics are of particular interest to inner city children? C. What are effective methods for teaching science to non-English speaking pupils?	3	2.8
17. Research on and development of valid and reliable science testing and grading procedures. Examples: A. Development of reliable evaluative instruments to measure effectiveness of science instruction (content and process) B. Effects of student evaluation on learning	1	.9

As can be noted the categories represented by the most responses 13.0 - 14.0 percent were for research related to preservice and inservice teacher education programs, curriculum development for contemporary science topics, and teaching strategies for learning in science.

Priorities cannot be assigned to the research statements from this data alone. Individuals contributed their concerns but were not given the opportunity to voice how important they thought their concern was in comparison to other concerns. An instrument has been prepared to collect information from a broad sample of elementary school teachers concerning their perception of the relative importance of these seventeen categories of research on elementary school science teaching. The instrument is Appendix B of this report.

Conclusions

Any conclusions drawn at this time would be premature and extremely tentative; therefore, statements of inference are being withheld until the data set is more complete and more organized in relation to priorities.

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Yeany, R. H., Duea, J., DeTure, L. R. and White, A. L., "A Study of the Research Priorities as Perceived by Public School Science Personnel", A paper presented at the 1979 Annual Meeting of NARST, Atlanta, Georgia, 1979.

Site #:____

Please place check marks in any boxes that apply:

SEX:
- ☐ Male
- ☐ Female

JOB DESCRIPTION:
- ☐ Teacher
- ☐ Department Head
- ☐ Administrator
- ☐ Science Supervisor or Coordinator
- ☐ Other

SUBJECT AREA YOU TEACH:
- ☐ Biology
- ☐ Chemistry
- ☐ General Science
- ☐ Earth Science
- ☐ Physics
- ☐ Other

GRADE LEVELS TAUGHT:
- ☐ K - 3rd
- ☐ 4th - 6th
- ☐ 7th - 9th
- ☐ 10th - 12th
- ☐ Other

YEARS OF EXPERIENCE:
- ☐ 1 - 5
- ☐ 6 - 10
- ☐ 11 - 15
- ☐ 16 & More

KIND OF COMMUNITY IN WHICH YOU WORK:
- ☐ Rural
- ☐ Small Town
- ☐ Large Town
- ☐ City

APPENDIX A

NATIONAL SCIENCE TEACHERS ASSOCIATION & NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING RESEARCH APPLIED TO THE SCIENCE CLASSROOM

NSTA and NARST recently asked secondary science teachers to identify research needs in science education. The areas which were identified are listed below. Please circle the number which best represents your opinion of the topic as a research priority in science education (examples are given to help clarify the topic):

	Priority High				Low
1. Research on effectiveness of individualized learning activities in science classes. Examples: A. Effects of individualized learning versus group pacing B. Effects of total contract courses versus lecture and exams C. How to manage individualized laboratory programs	1	2	3	4	5
2. Research on the effects of teaching science in the interdisciplinary dimension as it relates to areas such as mathematics, social studies, and reading. Examples: A. The relationship between using calculators in science class and an improvement in mathematical ability B. Relationship between math skills and science achievement C. Improving reading and language skills while teaching science D. The most effective methods to approach social issues in science	1	2	3	4	5
3. Research on the effectiveness of laboratory experiences in the science classroom. Examples: A. The effect of traditional lab experiences versus those involving inquiry B. Detailed look at benefits of laboratory science C. Use of safe practices in a laboratory experience	1	2	3	4	5
4. Research on the influence of public school science experiences on success in college science courses. Examples: A. The retention of scientific facts from high school to college B. Various learning systems versus student success in college science courses C. Research which analyzes the forms of science education and correlates them to the success of the students in college	1	2	3	4	5

CONTINUED ON BACK

	High Low		High Low
5. Research on the influence of teacher characteristics on pupil learning and attitudes. Examples: A. How the teacher's personality affects classroom learning B. Correlations between teachers' attitudes toward science	1 2 3 4 5	9. Research on the selection and sequencing of science content in the curriculum. Examples: A. Knowledge verses process: finding a balance in science instruction B. Effectiveness of sequencing of science courses (e.g., biology, chemistry, physics) C. Effectiveness of various science programs such as unified science	1 2 3 4 5
6. Research on motivational techniques that relate to learning and continued involvement in science. Examples: A. Research related to promising practices in teaching science to reluctant learners B. Techniques which generate enthusiasm in all students C. Ways of encouraging more students to take upper level courses	1 2 3 4 5	10. Research on the influence of science classroom experiences on cognitive achievement. Examples: A. How teaching strategies affect student achievement B. Which teaching methods work best for certain basic concepts? Lecture, lab, inquiry, rote, LAPS, etc. C. Research related to productivity of various patterns of interaction between teachers and students	1 2 3 4 5
7. Research on the effectiveness of supplementary science experiences (e.g., projects, clubs). Examples: A. Effects of student science projects on learning scientific principles and application of scientific methods to everyday situations B. Effectiveness of clubs and science fairs in teaching science C. Assisting students with the methods and procedures of project work	1 2 3 4 5	11. Research on the relationship of student cognitive development and learning styles to science curriculum development and teaching. Examples: A. Matching students' cognitive development to the teaching methods B. Learning styles of students and related effective teaching strategies C. Ways to identify the learning needs of students	1 2 3 4 5
8. Research on and development of valid and reliable science testing and grading procedures. Examples: A. Pass - fail verses A - F grades B. Development of reliable evaluative instruments to measure effectiveness of science instruction (content process) C. Effects of evaluation (grading) on student learning	1 2 3 4 5	12. Research on the influences of science classroom experiences on pupil attitudes. Examples: A. Evaluation of importance of supplementary science experiences and their effects on attitude development B. Relationship of classroom management techniques to student feelings about science C. A correlation between "hands-on" or cognitive experiences and attitudes toward science in general	1 2 3 4 5

APPENDIX B

NATIONAL SCIENCE TEACHERS ASSOCIATION & NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING RESEARCH APPLIED TO THE SCIENCE CLASSROOM

NSTA and NARST recently asked elementary science teachers to identify research needs in science education. The areas which were identified are listed below. Please circle the number which best represents your opinion of the topic as a research priority in elementary science education (examples are given to help clarify the topic):

Site #: ____

Please place check marks ☐ in any boxes that apply:

SEX:
- ☐ Male
- ☐ Female

JOB DESCRIPTION:
- ☐ Teacher
- ☐ Department Head
- ☐ Administrator
- ☐ Science Supervisor or Coordinator
- ☐ Other

GRADE LEVELS TAUGHT:
- K ☐ 1st ☐ 2nd ☐ 3rd ☐
- 4th ☐ 5th ☐ 6th ☐

YEARS OF EXPERIENCE:
- ☐ 1 - 5
- ☐ 6 - 10
- ☐ 11 - 15
- ☐ 16 & more

KIND OF COMMUNITY IN WHICH YOU WORK:
- ☐ Rural
- ☐ Small Town
- ☐ Large Town
- ☐ City

	Priority High				Low
1. Research on the relationship of student cognitive development and learning styles to science curriculum development & teaching. Examples: A. Matching students' cognitive development to the learning materials & activities B. Learning styles of students & related effective teaching strategies	1	2	3	4	5
2. Research on the influence of science classroom experiences on pupil attitudes. Examples: A. Why has there been a decreased interest in science? B. What is the relationship between affective and cognitive outcomes? C. Do science oriented lessons promote positive group interactions?	1	2	3	4	5
3. Research on the effectiveness of "hands-on" experiences in elementary school science. Examples: A. Is the hands-on approach better than a textbook approach? B. How do students with hands-on elementary science background perform in high school science? C. Does the hands-on science approach teach the necessary basics of science?	1	2	3	4	5
4. Research on the selection of science content in the curriculum. Examples: A. What scientific information should be considered basic to elementary school science? B. Do students need to know all the content in todays elementary science curriculum? C. Should we teach more practical science information such as knowledge of drugs, the body, and weather?	1	2	3	4	5
5. Research on the effects of specialized science teachers and facilities on teaching and learning of elementary school science. Examples: A. How do student gains of specialized and self-contained classroom teachers differ? B. Is science teaching in a special science room more effective than in a regular room?	1	2	3	4	5

	Priority High				Low
6. Research on development of effective curriculum for teaching contemporary topics such as energy, environment, and the human life cycle. Examples: A. How much can a primary child learn about energy and conservation? B. Can effective materials be developed on the human life cycle? C. How can we teach environmental science in grades 1-6?	1	2	3	4	5
7. Research on the effectiveness of the federally funded elementary science curriculum projects. Examples: A. Are the ESS, S-APA, and SCIS programs effective? B. Are students who use the ESS, S-APA or SCIS programs getting a good content background in science?	1	2	3	4	5

OVER

	Priority High				Low
8. Research to determine the appropriate and most effective balance of process skill and concept learning in elementary school science. Examples: A. How do the outcomes of a process centered approach and a content centered approach differ? B. Is there a need to learn more facts along with the investigative techniques? C. What are the effects of program which combine process and content?	1	2	3	4	5
9. Research on the effectiveness of science learning centers in elementary school science. Examples: A. What is the value of science oriented discovery centers? B. Can learning centers be effective for large groups?	1	2	3	4	5
10. Research on the effects of teaching science in the interdisciplinary dimension as it relates to areas such as mathematics and language arts. Examples: A. Relationship between math skills and science achievement B. Improving reading and language skills while teaching science C. The incorporation of science into daily curriculum	1	2	3	4	5
11. Research and development of more effective printed materials for teaching elementary school science. Examples: A. Can elementary science be taught in shorter units? B. How can readability of science materials be modified? C. How does the content of science texts compare to the content of standardized tests?	1	2	3	4	5
12. Research on the influence of pre and inservice teacher education programs on the science teaching behaviors and effectiveness of elementary teachers. Examples: A. How effective are inservice programs developed to help implement a particular science program? B. What is the relationship between a teacher's training and the performance of the pupils? C. What topics and format are appropriate for inservice workshops in elementary school science.	1	2	3	4	5

	Priority High				Low
13. Research on the sequencing of science content in the elementary curriculum. Examples: A. Can we develop continuity of concept formation from one grade level to another? B. Do certain concepts need to be taught before others? C. How effective is a spirally organized science curriculum	1	2	3	4	5
14. Research on and development of valid and reliable science testing and grading procedures. Examples: A. Development of reliable evaluative instruments to measure effectiveness of science instruction (content & process) B. Effects of student evaluation on learning	1	2	3	4	5
15. Research on the relationship of teaching strategies on learning in science. Examples: A. What activities are best suited for each process skill at various grade levels? B. What methods of teaching are most effective for learning science concepts at various grade levels? C. How does television instruction influence science learning?	1	2	3	4	5
16. Research and development of techniques and materials to assist disadvantaged elementary science students. Examples: A. How can visually or physically handicapped students participate in all areas of science? B. What science topics are of particular interest to inner city children? C. What are effective methods for teaching science to non-English speaking pupils?	1	2	3	4	5
17. Research on the learning outcomes of teacher determined versus student determined activities in elementary school science. Examples: A. How much direction for students is best in science teaching? B. How valuable are teacher demonstrations when compared to experiments done by children? C. Which is more beneficial, teacher directed science lessons or informal experiences that are part of play experiences	1	2	3	4	5